Transient Stability Example 2

Objectives:

1. Enter Synchronous Generator Data
2. Set Up Study Case Parameters
3. Check One-Line Display, Plots, Reports
4. Simulate A Bus Fault
5. Determine Critical System Separation Time
6. Perform Fault Isolation / System Separation
7. Perform Bus Transfer by Checking Bus Voltage/Hz Vector Difference
8. Perform Load Shedding Using Frequency Relay

Steps:

1. Load Project
    - TS_Example2

2. Enter Generator Data:

Generator	Gen1

Imp/Model Page

Rotor Type	Round-Rotor
Dynamic Model	Subtransient (Typical Data)

Inertia Page

Generator Inertia	0.9 MW-sec/MVA

Exciter Page

Exciter Type	1 (Sample Data)

Governor Page

Governor Type	ST1 (Sample Data)

PSS Page

PSS Type	None

3. Edit Study Case to Simulate a Bus Fault:

Events Page (Solution Parameters)

Simulation Time Step	0.001 sec.
Plot Time Step	10 x dt.
Total Simulation Time	10 sec.

Events Page (Events)

Event ID	FaultMainBus
Time	0.5 sec.

Events Page (Actions)

Device Type	Bus
Device ID	Main Bus
Action	3 Phase Fault

Plot Page

Plot Syn. Generator	Gen1
Plot Ind. Machines, MV	Mtr2, Pump 1
Plot Bus	Main Bus, Sub2B, Sub22, Sub23.

4. Run TS Study (1st time):
   - Run Transient Stability
   - Observe one-line display, plots and reports

5. Modify Study Case to Isolate the Fault by System Separation:

Events Page (Events)

Event ID (new)	SysSeparate
Time	0.7 sec.

Events Page (Actions)

Device Type (1st)	Circuit Breaker
Device ID	CB2
Action	Open
Device Type (2nd)	Circuit Breaker
Device ID	CB10
Action	Open
Device Type (3rd)	Generator
Device ID	Gen1
Action	Isoch.

Dyn Model Page

Reference Machine	Auto Assign A Reference Machine for each Sub-system

6. Re-Run TS Study (2nd time):
   - Observe Gen1 power angle, output power, Efd, etc.
   - Observe bus voltages.
   - Observe Mtr2 and Pump 1 slip, acceleration power, etc.

7. Modify Study Case to Simulate a Bus Transfer:

Check Voltage/Hz difference and Voltage Angle between bus Sub22 and Bus23 to find out an appropriate transferring time. (Note: Per standard, Voltage/Hz between the two buses should be less than 1.33 p.u. or 133%)

Events Page (Events)

Event ID (new)	BusTransfer
Time	0.75 sec. (3 cycles)

Events Page (Actions)

Device Type	Circuit Breaker
Device ID	CB25
Action	Close

8. Re-Run TS Study (3rd time):
   - Observe Mtr2 slip, acceleration power, voltage, etc.
   - Observe system frequency
   - Observe bus Sub22, Sub 23 voltages

9. Modify Study Case to Use LTC to Improve Bus Voltage:

Dyn Model Page

- Check Include LTC Action

10. Use Frequency Relay to Perform Load Shedding:

- Load She Priority Table:

Load Group	**MW Loading**	**Control Interlock**	**Priority**
DC System	0.658	CB19	Lower Priority
Sub3 Net	1.447	CB9	Higher Priority

- Option 1: Shed load by event and action
- Option 2: Shed load by frequency relay

FR1	Activate
Over/Under	Under
Setting (1st)	96
Unit	%Hz
CB ID	CB19
Action	Open
Delay	1 sec.
Setting (2nd)	99
Unit	%Hz
CB ID	CB9
Action	Open
Delay	5 sec.

- Set 81 Relay In Service

11. Re-Run TS Study (4th time):

- Observe system frequency
- Check Action List View for all actions
- Observe bus voltages
- Check to see if there are any other problems